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Journal of the Society of Arts.

FRIDAY, FEBRUARY 6, 1857.

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CONVERSAZIONI.

The Council have arranged for two Conversazioni for the Members of the Society and their friends, the first to take place on Saturday, the 21st of February, to which ladies will be invited; the second on Wednesday, the 6th of May, to which gentlemen only will be invited.

NINTH ANNUAL EXHIBITION OF INVENTIONS.

The Council have fixed Monday, the 23rd of March next, for the opening of the Ninth Annual Exhibition of Recent Inventions.

Persons intending to contribute to the Exhibition should communicate with the Secretary forthwith, stating—

1. The title of the invention.
2. Whether the article will be a specimen, model, or drawing.

Articles for exhibition must be forwarded to the House of the Society, *carriage paid.* The days for receiving articles are, Thursday, the 5th, Friday, the 6th, and Saturday, the 7th of March.

All articles should be accompanied with a short description of the invention, for the Catalogue, with a wood-block (when possible), and a reference to any publication where a fuller account may be found.

MEETING OF COUNCIL.

Feb. 4, 1857.

At a Special Meeting of the Council held this day, the following Resolutions were passed unanimously :—

"Resolved,—That the Secretary be instructed to inquire of the Institutions in Union whether they consider the time has arrived when, in order to give just facilities, throughout the United Kingdom, for acquiring knowledge in Art and Science, it is expedient that the National Museums situate in the metropolis and elsewhere, such as the National Gallery, the British Museum, the Museum of Ornamental Art, the Museum of Practical Geology, and the public Museums in Ireland and Scotland, &c., which have already acquired, or may hereafter acquire, by Parliamentary votes, specimens of Art and Science, should be rendered, as far as may be practicable, useful to the Local Institutions promoting Art, Science, and Literature, throughout the United Kingdom, especially the Mechanics' and Literary Institutions in Union with the Society, and Free Libraries.

"Should it be the opinion of the Institutions that the time has arrived, the Council of the Society of Arts request that they may be favoured with opinions as to how the object may be best carried into effect, and the Council will be prepared to afford facilities for the discussion of the subject.

"Resolved,—That a copy of this resolution be sent not only to the Institutions in Union, but also to the Provincial Museums which may not be in connection with the Society, and to the Free Libraries in the United Kingdom."

THE PRIVY COUNCIL OFFICE AND THE SOCIETY OF ARTS EXAMINATIONS.

The Lord President of Her Majesty's Privy Council having placed at the disposal of the Council of the Society the privilege of nominating two candidates as competitors in an Examination recently held by the Civil Service Commissioners for Clerkships in the Privy Council Office, the Council of the Society recommended to his Lordship, Robert Abbott, of Leeds, and William Mathew Taylor, of Windsor, both of whom had distinguished themselves at the Society's Examinations in June last. The Council have pleasure in announcing that their candidates have been successful, standing first and fourth on the list.

There were twenty-one selected competitors and five vacancies.

NINTH ORDINARY MEETING.

Wednesday, Feb. 4, 1857.

The Ninth Ordinary Meeting of the One Hundred and Third Session was held on Wednesday, the 4th inst., Thomas Winkworth, Esq., in the chair.

The following Candidates were balloted for, and duly elected members of the Society :—

Anderson, Pat
Cowper, Rt. Hon. William Francis, M.P.
Pitman, Edward
Rolleston, George, M.D.
Thompson, Richard.
Wyld, James.

The following gentlemen have been appointed Honorary Local Secretaries :—

James Spiers, Esq., for Oxford.
C. Ratcliff, Esq., for Wolverhampton.

The Paper read was :—

ON EXPERIMENTS WITH SILKWORMS, WITH A VIEW TO IMPROVE THE PRESENT SILK YIELDINGS OF BENGAL.

By F. Bashford, of Surdah, East Indies.

I have devoted my attention to silk reeling in Bengal for nearly twenty years, and have laboured hard to profuce a thread as fine, as perfect in the reel, and as well suited for manufacturing purposes in Europe, as French and Italian silk. I have succeeded so far as to merit the Medal of the Society of Arts, for my comparatively superior quality over other Bengals, none for many years past approaching Surdah (J. and R. W. Mark) by several shillings per pound in value. My reel has considerably surpassed China, and come up very close in the finer sizes to middling Italian in its various appliances and value, as a reference to any price current or manufacturer in England or Lyons will corroborate; still I find that I am far behind the finest sizes of both France and

Italy, and with a view to approach more nearly to them I have imported eggs of the finest cocoons reared in both those countries, with a view to engraft them upon the different species of worms indigenous or at present common in Bengal, and I received also a large quantity of the best China eggs with the same view, as the cocoons of that country are also superior to all we have in Bengal, although their silk is inferior.

I am desirous to give the result of my exertions to the public, as it may be a guide to others; and the giving myself this flattering introduction is to show that the experiments have been made by a practical man, who has charge of forty filatures, working 4,500 basins, and therefore interested in the favourable results of such experiments, and in any good that may accrue from the publicity of these remarks.

To enable my readers to understand the subject thoroughly, I will commence by mentioning that all our worms in Bengal for filature silk give us several crops of cocoons during the year, except a solitary species of annual, origin unknown, and rapidly becoming extinct.

The chief worm is what is called the dessie, or, as the word implies, country,—and I therefore conclude it to be aboriginal or indigenous; it supplies nearly all the cocoons of the large November bund, or cold weather crop of Bengal, and yields the finest silk; the cocoons are small, and it is therefore sometimes called the chota poloo, or small worm in some districts; the produce of the best quality may be taken at about 10,500 cocoons to the pound of silk; this worm thrives best in the cold weather, and the cocoons are better then than the after crops, but it continues more or less in the different districts throughout the year; the period from the hatching of the egg till the completion of the cocoon of this worm is about thirty-six days in the cold weather, but much less as the heat increases.

The next species of importance is the madrassie; the native meaning of the word is seaborn, and I therefore conclude this to be an important species; it is sometimes called nystree; it is produced throughout the year, but thrives much the best in the hot weather, from March to September, is remarkably hardy, and easily and economically reared; from this species we derive in the March and rainy bunds a very large supply of cocoons; the produce is comparatively better than that of the dessie, about 10,000 of the best cocoons being required to produce one pound of silk, but the fibre is neither quite so strong nor the colour so bright, though it nevertheless produces a very good thread if carefully reeled; these worms pass through their stages so rapidly, that from the time of hatching to the completion of the cocoon is frequently not over 25 days. Thus, you see, two distinct species of cocoons are providentially arranged for our different seasons.

The next is the boro polo, or in English—large worm. This is an annual, and I cannot trace its origin; it existed when the East India Company first imported Italian eggs, all of which soon failed. The boro polo is now chiefly found in the Radnagore district, and from this worm they get much of their March bund; but it is failing fast; it used to exist in other districts, and the silk from it was very beautiful, and the produce nearly double that of other cocoons, but from frequent failures, irregular hatching, and greater expense in rearing, and being an annual worm only, the natives have taken a dislike to it, and I fear it will soon be as scarce in Radnagore as it now is in other districts; they have another species of worm in Radnagore, called the China, but how it acquired that name I do not know, as in China their worms are annuals, and this is not; the cocoon is certainly unlike in shape and very inferior to the China, and even inferior to our dessie and madrassie. I have now described the best species of our Bengal silkworms, and I have shown that it requires 10,000 of our best cocoons to produce me one pound of good silk; in France 2,500 cocoons produce the same quantity of silk. This disparity in produce between the Bengal and European cocoons must forcibly strike every reader of this paper, and the natural suggestion will be, that if Bengal could produce cocoons equal to French and Italian, the quantity of worms they now rear would nearly supply the whole of Europe with silk.

Actuated by a desire to improve our cocoons, and seeing no reason to doubt the possibility of it in a country so beautifully supplied with mulberry and every convenience for rearing worms as this is, I imported a large quantity of the best French, Italian and China eggs to engraft upon the different puny species of our Bengal monthly race.

I had no desire to introduce an annual, as this is a worm only intended by nature for cold climates, where there is but one crop of mulberry in the year; here, we no sooner cut down our bush mulberry, than it springs up again, and in 5 or 6 weeks we have a second luxurious crop; in a country, therefore, so bountifully and continually supplied with mulberry, an annual worm (which at best is always irregular) is not required, and would not be encouraged by the natives.

I imported the annual eggs merely for one crop of cocoons that I might have the moths to couple and cross upon our Bengali monthly race, and give new strength and vigour to that. I now proceed to explain the nature of my experiments, and their results.

In February, 1854, I received per overland a large quantity of the best French silkworms' eggs; they were however indifferently packed, and only 5 or 6000 eggs were good out of a very large parcel; some of these commenced hatching about 15 days after the box was opened, with the thermometer ranging form 60 to 70 Fahrenheit, and they continued hatching very irregularly for about three months, during which time the thermometer at midday reached about 100 in the house.

I treated the little worms precisely as the worms of this country, feeding them at first with finely-cut tender mulberry leaves, giving the larger and older leaves as they increased in size and strength; they fed and thrived very well, displayed a better constitution, and more hardy nature than our country worms; their stages of sickness were in the colder weather at six to eight days' interval, but more rapid as the heat became greater; they got over them very well, and but few died until near the time of spinning, when the usual disease attending our country worms attacked some of these, from which they chiefly died, recovery being very rare. As we have no remedy for these diseases the usual fumigations were tried, but with little success.

The healthy few of the early incubations, astonishingly large and strong compared to our country stock, were placed to spin in mat frames, such as are used by the natives in their rearing establishments, (as I used them from the beginning to become habituated to the very convenient custom of this country), and they gave very beautiful cocoons, some quite equal in size, shape and firmness to the samples received with the eggs, and seemed to spin in our frames, as easily (these mat frames take up little room and are vastly more convenient than twigs,) as they do on the twigs in France.

I was quite pleased with the cocoons, and the natives were truly astonished, they had never seen any like them: the later worms having to bear extremely hot weather, did not succeed so well. The irregularity of hatching was very inconvenient; and referring to the old East India Company's experiments I find similar complaints of their Italian eggs, (though they never attempted to cross and naturalize as I am doing). Having so far succeeded with the cocoons, I allowed the moths to eat out and then obtained both male and female moths of our dessie and madrassee stock, and paired the French male with the country female and the country male with the French female. The disparity of size was immense; however, impregnation was effectual; and the eggs were deposited in due time, both pairings alike giving eggs of a yellowish colour, when deposited, but after three days those from the French female and Bengal male turned dark and remained unhatched until the next year, passing through our hottest season with the thermometer frequently at 105°; here was my first disappointment; the eggs from the French male and the country female remained yellow until the seventh day, when they displayed a dark speck, rapidly changed to slate colour and all hatched on the tenth day. The young worms were strong and healthy, and fed well, but were more rapid in their stages, owing as much perhaps to the warmer weather as to their altered nature; the same diseases attacked some of these, a few days before spinning, which had proved fatal to a few of the first batch; the operation of spinning was more tardy at the commencement, the cocoons more flossy, and less firm than the original; they were quite as large, but altered in shape, being very round at one end and pointed at the other, without the least contraction in the centre, or shewing much resemblance to the French, except in the larger size and stronger fibre; there was a vast improvement upon the Bengali stock. These worms, from the time of hatching to spinning, occupied thirty-four days.

I kept all the cocoons for seed, pairing nearly all of them in themselves, fully expecting that this one cross would suffice, and realize my wishes of improving our breed without altering their nature of hatching; however, I was sadly disappointed, for on the third day all the eggs turned black, and remained thus until the following year. The very few of this cross that I did not pair in themselves, were paired with indigenous moths, making a second cross for the French male; of these the cross female with the country male, followed the steps of the preceding; the cross male with the country female hatched, but owing to very bad weather, I did not succeed in getting any cocoons to continue the family, and thus ended all my labours in this department for the year 1854, with what success my readers can judge. I reeled off a few of both the pure and cross cocoons that I had reared, and the silk was quite equal to the best French; the best cross cocoons, though changed in shape, gave nearly as good produce as the pure, and as strong a fibre. The change in the shape did not in any way detract from its produce or reeling quality, which is generally supposed to be the case on the continent. As I before remarked, I had Italian and China eggs, and the result was precisely the same as with the French. It may be asked, why I imported the China eggs, when the China silk is inferior to our own reel. My reply is, that China cocoons, although small, are infinitely superior to our own dessie and madrassie sorts, and, in my opinion, capable of making, with good management, as fine and valuable a silk as Italian; and the reason the Chinese reel is of inferior quality to these, is entirely owing to their own bad management.

I commenced the year 1855 with the first cross French, Italian, and China females upon our madrassie and dessie stock, and second cross French. Italian, and China males produce upon our females, which had gone back to annuals; and about the time these eggs began to hatch in January, 1855, I received another large supply of French eggs, which were hatching on arrival. They were in beautiful order, having come out on cloth loosely packed. I had now such a quantity of eggs of different sorts, that it was very difficult to keep them separate; however, they had as much care bestowed on them as possible. Incubation of all the crosses went on as irregularly as with the first importation, and it was several months before any one batch had finished hatching. This year's experiments were interrupted by my being ill, and compelled to go to England for a few months, but a great many cocoons were obtained from the different crosses and paired in themselves, which gave eggs that turned black, and remained in statu quo until the next year. A few of the pure French were kept pure, but some were crossed upon the last year's crosses, and the result left unknown until incubation; the following year there was very little difference in the cocoons over last year's, the offspring of the China female retained its original white colour, but the shape altered to a point at both ends; the cocoon, if anything, was larger, and the fibre seemed as strong as the parent cocoons, and this was the case with the fibre of all the other crosses. This was a very unfavourable year for experiments, and many thousands of the worms died.

On my return from Europe, I found a good supply of healthy looking eggs of the different sorts, and have continued the experiments this year (1856) with unabated perseverance. They began hatching early in January, but just as irregularly as before; a small quantity only came out daily, and did not cease till May. The early worms were all good, fed and thrived as well as I could desire, and the cocoons from them were very fine. I had an opportunity of again comparing the pure French cocoons reared by me, with the different crosses, and the choice was greatly in favour of the pure, but the cross cocoons were vastly superior to those of Bengal; and what I reeled off in the filature gave a most beautiful silk, and a yield in quantity more than twice as large as the common cocoons of this country, which we were then reeling in the filatures; thus, much of the intrinsic value of the French cocoon remained, but none of its original shape. I supposed now, that I had so far reduced the original nature by the frequent crosses, as to be nearly certain of their now assimilating in habits, &c. &c., with our country worms, and I did not reduce them by further crossing, but allowed the moths to couple with themselves; great was my astonishment to find, after the eggs had been deposited three days, that most of them had turned black, indicating that they still had too much French nature; a few remained yellow, and hatched after ten days. How to account for the freak of nature with regard to the rest, I do not know, but I had still to be more surprised after this. I had to wait, of course, until next year, to see the result of the black eggs, but those that hatched gave me ample occupation for the time, and I watched and cared for them with the greatest interest; the young worms looked healthy, ate, and throve well, and in due time gave cocoons; the white colour alone proved the China portion, and the superior size of cocoon fibre, and lighter colour of some, with less gloss than with our common worm, showed the French and Italian cross. I was, on the whole, satisfied with this cross, and trusted my labours had met with success, but great was my astonishment after the pairing, to see more than half of these eggs again revert back to annuals, though there had been a complete break in their nature by their having hatched in January, given cocoons in February, eaten out in due time, paired in themselves, deposited eggs that ten days after hatched, and now to fall back, not to hatch again until the ensuing January 1857, I fancy is extraordinary in the extreme. From the portion that hatched I had another crop of good cocoons, and their eggs I distributed to several parts of India. Strange to say, many of those reverted back to the nature of annuals, and from those that did not, owing to bad weather at the time of spinning, but very few, much reduced in strength and quality, are left to me to continue my experiments. I am now in the midst of the rains, our worst season for cocoons, but still I have these few, and am bestowing on them the greatest possible care; what may be their *ultimate* fate I must leave for a future communication. I have many pounds of eggs of the different crosses still retaining the nature of annuals, but as I have spent three years in trying ineffectually to engraft a superior natnre and invigorate our common stock, I feel discouraged, and would gladly have the opinion of naturalists as to the probability of my object ever being attainable, and the proper steps to be taken for realizing it.

I have every belief in the possibility of improving our Bengal silkworms, under a better system of management; and have no doubt, those of Europe have only acquired their present perfection by care and tuition. The superb cocoons I saw at the late French Exhibition, were a proof what art and careful management can produce.

Silkworms are said to have been originally imported from China. I have lately seen specimens of the best domestic cocoons now being reared in that country, and those common in Europe are more than double their size and weight in silk, thus clearly proving that the worm has either degenerated in its natural country, or that European skill has worked the vastly improving change in its nature and constitution; this latter, I think, is the truth the main difference in the cocoon is in the size, the shape being still much the same. I, however, allude to the China white cocoon only.

In Syria, the cocoons are in size and quality nearly equal to French, and as their climate is not far different from Bengal in our dry season, I see no good reason why we should not be able to produce as fine cocoons. A long and tedious crossing may be necessary to work the change, but whatever labour is required, the immense improvement in quality and produce that is certain to result would amply compensate for both labour and expense; and as the gain would be a public good, the Government and public should encourage the undertaking. I am willing to present eggs to any one disposed to follow my steps, and the more diffused the experiments the better chance of success.

I am not satisfied that the present domestic races of silkworms are not originally wild, and fed on other food than mulberry; the forests of India teem with various species of silkworms feeding on all sorts of leaves; accident may have led to the choice of mulberry, and it certainly is the best suited for yielding a mellow and easy winding silk.

I have not been able to make any experiments on any wild silkworms, except on the *Bombyx Huttoni*, but I believe it possible to domesticate a great many of the wild species, and, by changing their food, to make them produce a silk less harsh and crude than they now do, and cocoons that will yield their thread freely, without the aid of alkali or other chemicals just as the domestic worm does. The Société Zoologique d'Acclimatation are producing wonderful changes, and why should not we do the same in silkworms. I see no reason to the contrary.

As this paper may fall into the hands of practical people in Europe, who may be disposed to aid a good object, I will subjoin a few remarks upon the mode of rearing silkworms, usually practised by the natives in Bengal. I am not sure if their defective system could be remedied, whether the produce of our present stock of worms could not be vastly improved, so as to render the importation of foreign species unnecessary. These remarks will enable my readers to form an opinion on the subject, but I must mention that the natives are so pertinaciously callous of improvements if they involve any labour or expense, and are almost as immoveable in their prejudices as the pyramids, that unless any beneficial changes can be effected in a most simple and inexpensive way, I have little hope of their attempting and persevering in them.

In the first place I will try and describe the mulberry, and mode of cultivating it. The sort chiefly grown here is the wild black species, both the indented and unindented leaf, planted indiscriminately, a handful of cuttings of both sorts forming one bush; and these bushes in rows, about a foot apart, cover large tracts of ground. The natives care little about the species, nor do they consider which is best suited for the worms; suffice it to say, they follow the customs of their forefathers, and that satisfies them; they, however, bestow much labour on the cultivation, and from well managed lands, get several extraordinarily large crops of leaf during the year; it is cut every time close to the ground, and after a little hoeing it springs up again most rapidly. The leaves are cut into small pieces for the very young worms, but after that stems and all are given just as they come from the field. As far as I can judge of the mulberry, it is quite as good for feeding worms and producing silk as the large tree mulberry of Europe. Certainly, the French and Italian worms I fed on it gave cocoons quite as good, or even better, than the specimens that accompanied the eggs. Mulberry is very expensive, and the natives are prone to half feed and stint their worms in consequence, to the great injury, of course, of the cocoon. It is sufficient to them if they have quantity; they have little regard for goodness of quality in any thing.

In the selection of eggs, there is a great choice in India as to the period for incubation, but as the cocoons are alike in every district nearly, there is but little choice as to quality. In one part or other of Bengal worms are spinning nearly every day in the year, but in the rains fewer worms are reared from the lower lands than at any other period, partly because the mulberry is frequently subject to inundation, and partly from the rice crops at this season demanding more attention. At this present moment, 15th September, 1856, most of the mulberry in Bengal, and very many of the filatures also, are some feet under water. The inundation begins to recede in September, and by the end of October, the mulberry is cut and thrown away, and the lands in a forward state of cultivation. Early in November the majority of the rearers procure the cocoons, from which they get the seed for the November bund, the largest we have in the year. Eggs are not sold here as in Europe; seed cocoons are sold instead; the rearers pair the moths and manage them as they like,—they have no fixed system. When seed cocoons are dear, the good and bad are all equal in their estimation; they never sort them; they pay high for them, and cannot afford to lose any—such is their reasoning. Rearing-houses in Bengal are of mud or mat walls, and straw roof; they are generally very small, and, notwithstanding the great heat, have no windows or ventilators, or any other means of lighting the room, except a single fine lattice-screened doorway; they are alike indifferent to light or temperature, to light particularly, and they have some reason for this, for without screens of lattice net work, the flies would enter and destroy every worm in two or three days; even now, millions are destroyed yearly by the flies entering the room at feeding time, and many a batch of apparently good cocoons over night have been found destroyed in the morning by maggots coming out of them from fly blows on the worms before spinning. In cold weather I have known fires used by a few at the doors of their rearing-houses, but very rarely, and the good is questionable for such unventilated buildings. The fluctuations of temperature in Bengal are considerable during the year, and even in the 24 hours frequently as much as 20°; no attempt is made to equalise it in the rearing-houses, which are crammed with worms and necessarily close and offensive; our worms, therefore, passing through all these disadvantages at once prove their hardy nature. From worms generally indifferently fed, and reared in masses, in close, unventilated, and unhealthy houses, you cannot expect the best cocoons, but from the very few independent and most careful rearers, we do sometimes get very fair quality, from 15 lbs. of which, or about 9,500 cocoons, you may reel 1 lb. of very good silk; but every batch of cocoons varies so much in quality it is impossible to fix an average; the rearers are generally very poor people, and the larger portion of them rarely produce over 100 lbs. of cocoons each bund; many even less, and they too often exceed their means and stint their worms in accomplishing this. The tendency of the larger rearers is the same way; they rarely calculate their means, and attempt to rear a larger quantity than they have either space or food for, and satisfy themselves with quantity rather than quality; barring these few exceptions, the majority of silk rearers are in the hands of money lenders, who charge from 30 to 40 per cent. for the accommodation, which would absorb all the profits, if instead of employing their families, they had to hire labour; few or none of them, as you may suppose, reel off their own cocoons, and as they have no means to bear the loss, should any arise from attempts to improve upon the present system of rearing, they do not trouble themselves about it, and if we (Europeans) desire to see any improvement in the cocoons, we must bestir ourselves to effect it, and when the extra profit is palpable to the natives, they will doubtless come in and reap it. With cocoons, such as we now have, and treated as they now are, we cannot reel a better silk than I have produced, my best having already reached 35s. 6d. per lb. I have seen our cocoons reeled at a first-rate filature in France, and a better thread was not obtained there than we can command here. Our operatives are not at all inferior in ability, but they are not half so tractable or careful, and in this is our greatest misfortune, and being a national failing, it is most difficult to surmount; the rich native reelers encourage it; their great aim, as in all other things, is the largest quantity for the smallest price; they have no regard or estimation for quality, and the cocoons from which I get barely 1 lb. of silk they would get 1½ at least, and at much less expense for reeling. There are so few Europeans in Calcutta who know any thing of silk, that the natives find no difficulty in selling their trash at profitable prices, and are consequently formidable competitors with us for cocoons, and create opposition from the operatives, who would far rather take employment where they can reel carelessly than come to our better regulated establishments, where strict attention is demanded from them; however, we cannot complain of the native filatures; if manufacturers at home will buy their trash at profitable prices to them, they are quite right in attempting no improvements.

The general treatment of cocoons in this country before reeling them is also bad in the extreme. They are usually sunned till they are as dry as chips, then baked and sunned again, the gum undergoing baneful changes; the colour becomes faded, the fibre reduced in strength, elasticity destroyed, and the worms so dried up as to have no weight to keep down the cocoon at the time of reeling, and the thread consequently comes off less clean than it might; and as to sorting the cocoons or taking off the floss, that is quite neglected, it would reduce the produce; this practice has been handed down from generation to generation, and I have had the greatest difficulty in altering it in the Surdah filatures, and other Europeans I fancy have found the same difficulty with their establishments. Europeans never rear cocoons in Bengal; this department is entirely confined to the natives, and we are obliged to purchase them through middle-men, who go from house to house for the purpose.

DISCUSSION.

The Chairman said that the paper just read was not only valuable in itself, from the evidence it afforded of the capacity of that great country, India, to produce the best raw silk, when scientific and careful attention was given to its culture, but there were circumstances operating at the present moment which invested it with additional importance. The failure, to a large extent, during the last year or two, of the silk crops of Italy and France, and the impending interruption to commercial enterprise with China, rendered the discovery or application of any processes by which silk of a similar quality might be so improved as to make up for those deficient supplies, a matter of great interest. Since the introduction of comparative free trade in 1846, and even on its partial introduction so far back as 1826, the demand for silk goods had become so extensive, both abroad and at home, that the ordinary supplies of the raw material had hardly kept pace with it. Hence efforts had been made in British Guiana, particularly in Demerara, and also in some of the West India islands, to cultivate its growth, and he (the chairman) was encouraged to hope, from private sources of information, that they would not be wholly unsuccessful. Indeed, there seemed to be a prospect of other important manufactures receiving some of their raw materials from these colonies, as flax, &c. He had observed that day, that amongst the subjects for discussion during this session in the House of Commons there was a notice of a motion having special reference to this subject. An industry which involved probably not less than fifty millions in factories, mills, and plant generally—from six to eight millions annually in material and labour, and which gave employment to more than a million persons, deserved every encouragement. The statistics on these points had never yet, to his knowledge, been supplied, and these statements could only therefore be taken approximately. The chairman concluded by inviting discussion on the paper.

Mr. Francis Bennoch rose and said—In the first place he thought the Council had exercised a wise discretion in bringing forward this paper on the present occasion; because, probably, no subject could have been introduced, which in itself possessed inherently so deep an interest to the commercial world at the present juncture as that of the cultivation of silk. When they remembered the large trade that was conducted in this article—when they knew, as had been stated by the chairman, the large number of people who were dependent for a livelihood upon its various processes of manufacture in this country, they could not fail to see its importance. He found from the number of bales of silk introduced into this country last year, that the value of the raw material from all parts could not have been less than eight millions sterling. Eight millions of money for the raw material was a very large sum, and the cost of the labour added to that would show the enormous interests involved. They had heard how Mr. Bashford had cultivated the silkworm and endeavoured to improve it. He had, unfortunately, to a large extent, as he had acknowledged, failed in his endeavours; nevertheless, he (Mr. Bennoch) had no doubt whatever, that the facts brought forward in this paper would probably incite naturalists to devote their attention to the subject, and thus lead to the introduction of a new variety of worm, and a superior quality of East Indian silk. It was somewhat singular, nevertheless, that although private enterprise had been most active in our Indian empire during the last 20 years, the production of silk and the imports of silk into this country from that part of the British possessions, instead of increasing had actually diminished, and were less than they were six-and-twenty years ago. In the year 1830 the quantity of Bengal silk introduced into this country was 8726 bales; he found also that the quantity had gone on, sometimes diminishing, sometimes increasing, until from 1830 to 1837 the quantity had gone back to what it was in 1830; there was, during that period, considerable variation in the quantity of silk imported from India. In 1844, twelve years ago, we imported the large number of 11,000 bales, whilst in 1848 we imported only 4924 bales; but the quantity of silk received from Bengal during the last year was 13,839 bales, while in the year before, in 1855, it was only 8228 bales, or less than it was in 1830. This was not particularly encouraging; and it was clear that there was not that increase in the cultivation of silk in the East Indies which there ought to have been, considering *the con*tinually increasing demand throughout all Europe. But it was consolatory to find that the inhabitants of the Celestial Empire, who regarded the people of European nations as utter barbarians, were fortunately able to supply the wants of this country, although we, with our various dependencies, had done but little towards increasing the supply. He found that in 1830 the quantity of China silk imported into this country was only 4842 bales, or very little more than half the quantity imported from India, whilst last year the quantity of silk imported from China was 58,551 bales. He had prepared a table* shewing the amount of imports of silk, all the details of which, however, he would not trouble them with now. It presented facts which he thought would startle even the author of this paper. They found that although they had not materially increased the quantity of silk from Bengal, yet that the quantity from almost every other silk-producing country had very considerably increased. From Persia, 455 bales were imported in 1830, and the quantity since that time had varied in proportion to the probabilities of profit upon the importation of that article into the European markets; but the average importation of Persian silk since 1836 had risen somewhere between 2000 and 2500 bales per annum. From Broussa the quantity of silk had been small until within the last 4 or 5 years, and here was a point to which some attention ought to be devoted. Up to within the last four or five years the Broussa silk ranked in the market as equal to the best Bengal samples, but not equal to the China; but the Greeks, who sometimes seemed to teach us commercial lessons, had taken an opportunity of testing the quality of the Broussa fibre; and having applied the known improvements to the reeling of the silk, had brought a quality into the market which ranked second only to the Italian. They had imported the cocoons from the country where they were produced, and had them reeled in Italy, or else had transferred from Italy the machinery for reeling the cocoons; and the result had been, that they had produced an article which competed successfully with the Italian qualities. Although they had a return of only the small quantity of 143 bales of Broussa silk imported, there was no doubt that a large quantity of silk had been introduced under another name, which had ranked as Italian silk. No doubt the same principle applied in Bengal, as suggested by Mr. Bashford, would in the course of time, give us from our own possessions, a quality of silk that would compete successfully with any of the samples introduced into the European markets; and the fact became doubly interesting in connection with the large falling off that had lately taken place in the supply of silk in Europe. It had been calculated, that during the last year they had not received from Italy and France, taken together, more than half an average crop of silk, if so much—some had put it only at one-third—so that the demand for the finer qualities of silk for continental use was beyond the produce; and the French manufacturers who excelled in their silk fabrics, had discovered at last that there was something in the character and quality of the China silks imported into this country, and also in Bengal silks, which might tend to keep up the supply which unfortunately amongst themselves, had diminished so greatly. Nay, more, he believed by attention to the manner of getting up the silks it was probable that the quality imported would be so good as to diminish the disparity which had hitherto existed between Italian and French silks and those from Bengal and China. There was also another fact in connection with the falling off in the supply of silks in the European markets, the causes of which had been very frequently discussed. A well-written article—a condensation of almost all that is known upon this subject, appeared some six weeks ago in one of the metropolitan newspapers, which he thought in part solved the problem. It was a curious fact,—but not curious in reality,—that the silkworm would follow the ordinary laws of nature; over-indulgence, over-feeding, did not always produce the healthiest frame and constitution. A man who ate and drank to excess, probably would not be so strong or so healthy a man as one who ate and drank moderately; and who took abundant exercise. This principle had been found to apply to the cultivation of the silkworm. When the creature depended for its food upon the hardy mulberry plant of Italy it produced a good quality of silk, far superior to what is now produced. At the time to which he was referring, one ounce of eggs properly cultivated and fed in the usual manner by the peasants, produced 140 pounds of silk, but ultimately those connected with the culture of the silkworm became divided into two classes; one class being the growers of the mulberry leaf, and the other class the breeders of the silkworm. It became important to the mulberry grower, to produce as many leaves as he could to sell to the breeders of the silkworm. They therefore transplanted the hardy mountain mulberry plant into the plains, and, by richly manuring, produced an immense quantity of leaves; but whilst they increased the crop of mulberry leaves, they did not increase the crop of silk; there was a large quantity of matter, without a proportionate increase of fibre. The result was, instead of one ounce of eggs producing 140 lbs. of silk, the produce gradually diminished to 100 lbs., 80 lbs., 50 lbs., and 30 lbs., and last year the average from one ounce of eggs was only 14 lbs., instead of 140 lbs. within the last five-and-twenty years. Here then was a fact which demanded attention, because, not only was the quantity of the silk diminished, but the quality greatly deteriorated. As were the leaves so must the silk be. The coarse and bloated leaves compelled the worms to produce a coarse, irregular, and unhealthy fibre. Those were a few facts which he thought worth dwelling upon in a meeting like this, because they found both the quality and the quantity of the silk diminished. The fact was, the growers of the leaves and the breeders of the worms, instead of having one common interest together, had a divided interest, and unfortunately the grower of the leaves—the agriculturist—had become the dictator to those who bred the worms. The article to which he before alluded entered upon the subject in a truly philosophical manner, and would form a useful accompaniment to the highly practical and valuable contribution of Mr. Bashford. The fact that as a nation we are scarcely doing anything with regard to the cultivation of silk in India, and the knowledge that the yield of silk was diminished in consequence of a grasping policy, based on cupidity, all these things would probably suggest to the mind of some enterprising man the advantages he would derive from introducing into our Indian empire an entirely new and improved system with regard to the

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* IMPORTS OF SILK.

China Bales.	Bengal Bales.	Persian Bales.	Broussa Bales.	Italian Bales.	Total.	Date.
4,842	8,726	455	2,384	6,334	22,741	1830
5,053	7,475	1,569	1,703	6,564	22,364	1831
8,337	6,556	729	1,338	4,605	21,565	1832
5,884	5,169	729	1,737	6,260	19,779	1833
9,531	6,256	2,120	1,382	3,533	22,822	1834
7,858	6,909	2,128	2,703	5,665	25,263	1835
13,035	8,099	2,016	3,172	5,791	32,113	1836
18,429	8,752	2,330	915	3,232	33,658	1837
6,473	7,906	998	2,470	5,221	23,008	1838
3,708	9,545	2,550	2,162	5,656	23,621	1839
3,162	7,409	2,642	3,179	7,117	23,509	1840
3,727	6,744	2,981	2,653	5,199	22,204	1841
1,951	8,866	1,306	3,598	7,612	23,333	1842
2,651	8,086	1,700	2,761	6,710	21,908	1843
3,782	11,505	3,303	3,027	6,166	27,783	1844
11,358	12,031	198	2,071	5,703	31,361	1845
20,270	8,835	2,210	1,509	4,182	37,006	1846
22,379	7,292	825	1,228	3,740	35,464	1847
23,692	4,924	1,389	1,439	7,439	38,883	1848
21,422	10,090	1,085	1,162	5,830	39,589	1849
21,008	10,295	4,259	2,339	3,712	41,613	1850
23,109	3,811	3,020	1,123	3,200	39,263	1851
28,704	11,684	3,032	1,503	2,717	47,640	1852
35,563	9,026	5,824	630	4,600	55,643	1853
60,319	9,345	1,678	154	4,306	75,802	1854
52,210	8,228	1,530	250	2,875	65,093	1855
58,551	13,839	1,858	143	2,784	77,175	1856

production of silk. Although they could not but congratulate themselves upon receiving so valuable a contribution to the information which they were in the habit of annually receiving in this Society in the paper communicated by Mr. Bashford, yet he (Mr. Bennoch) thought there were some points connected with this subject which it would be well to explain, and probably Mr. Bashford might be induced, on a future occasion, to supply further details with which they were at present unacquainted. The author of the paper had given some numbers and weights, but these were difficult to deal with. Had he told them the number of pounds of cocoons that it took to produce a pound of silk, they would then have had a basis of calculation by which they could have compared his plan with others, and the results as compared with those in Italy and France. The quantity of cocoons to produce one pound of silk was found to vary, according to locality, from 4½ to 5 lbs. of cocoons to the pound of silk in that condition to be fit for the hands of the throwster, which was the preliminary process prior to its being put into the hands of the manufacturer for weaving into the various fabrics. Another point was the great difficulty the author of the paper had met with in the ignorance, prejudice, and stupidity of the natives. Instead of doing all they could to assist him in his endeavours to improve the quality of the silk in India, they were satisfied with the coarsest products so long as they obtained a profit. It was difficult to upset their old plans; therefore it was important that the East Indian Government, or an association of individuals, should initiate a movement for the improvement of the silk cultivation in that important part of our possessions, and do for the silk trade of this country what the Manchester manufactures had done with regard to cotton, namely, when they found the supplies falling off in one quarter, to try to discover other and fresh sources of supply of the raw material which formed the basis of their great staple manufacture, independently of all foreign ones. The world itself was the great field of commercial operation. One country, from natural circumstances or resources, would produce a better commodity than another country, whilst on the other hand this country would produce articles better and cheaper than other countries, thus creating a free interchange of commodities. If they discovered that the supply of silk was diminishing, it behoved them to look a-head for fresh sources of supply, so that they might not have their mills standing still and their operatives unimployed and starving for want of material. Such being the case, he thought the large manufacturers ought to associate themselves together for that great purpose. If it were not for an unhealthy principle of competition—association for such a purpose would bring about the most beneficial results. It was too much the object in business to grow rich as fast as they could; it was an amiable weakness, no doubt; but, nevertheless, there were some principles of national honour which ought to rise superior to our individual interests; and if they could, by a combination such as he had suggested, carry out the important objects in view, he knew of no question that demanded their attention so much as the proper cultivation of the silkworm, and the production of a better supply of that valuable material. Arising out of the great diminution of the supplies from other quarters, was no doubt the increase of the supply received from the Chinese. It was certain that but for the energy and industry of these people there would not be a supply of silk enough for half the manufacturers of England. The supply had been rapid, and had come at the very moment when it was most wanted; so recently as 1851 the quantity of silk introduced into this country from China was only 23,000 bales, whereas they found in 1853 it was 35,000 bales; in 1854, 60,000 bales; in 1855 it was 52,000 bales: and in 1856 it was 58,000 bales. Where would the silk manufacturers of England have been but for the energy, industry, and perseverance of the Chinese people, whom they were accustomed to look upon with a sort of contempt. In conclusion, he begged to express his acknowledgments to Mr. Bashford for the information he had communicated, with a hope that further details would be afforded at a future opportunity.

Mr. LECKIE (of the firm of Durant and Co.) said, having heard the paper of Mr. Bashford he could endorse most of the statements contained in it. He had known the author for many years, and for the last five or six years the whole, or nearly the whole, of his produce of silk had passed through his (Mr. Leckie's) hands; and he could say that during that period it had been an improving production. During the lifetime of Mr. Watson that gentleman went to great expense in making experiments with a view to improve the quality of silk produced in India. He took out with him workmen from France and Italy, and also the most improved machinery for reeling. He erected a steam factory, and spent a fortune in trying to improve the system of reeling, but he found, as Mr. Bashford had observed, the natives so obstinate and prejudiced that he was compelled to give it up. He looked upon this as one of the great causes of the non-improvement of the silk production of India. Added to this was the unhealthy character of the climate in the low lands to European constitutions, which compelled most of the reelers to return to their own country for the sake of their health. With reference to the production of silk in India he thought the figures of Mr. Bennoch did not exactly represent the actual state of the case. With regard to the year 1848, which was referred to as being one in which the importations of silk were very small, it was to be borne in mind that that was the season of the French revolution, during which the great silk magazines were shut up. He might remark that at the time when French organzine was fetching 46s. per pound, China silk was scarcely saleable at from 18s. 6d. to 20s. Bengal silk was then worth from 5s. 6d. to 6s. per pound only, but it now found buyers at from 15s. to 15s. 6d. In 1848 the first of the November bund of Bengal silk sold at 12s. 9d. to 13s. That silk, if they had it now, would be worth 35s. The low price which Bengal silk formerly produced in the European market might be placed amongst the reasons for the small importation of that article. Another fact was, that a great portion of the silk produced in India was used in fabrics there, and this was found to pay the producers better than exporting it at 8s. or 9s. per pound. A great quantity of the silk was manufactured into corahs and sashes for the ladies, and it was rarely that even the poorest of the natives had not some article of silk upon them; besides which they supplied the Arabs of the Persian Gulf and the Straits. With regard to the statement that Mr. Bashford's silks realised many shillings per pound more than other samples from the same district, he (Mr. Leckie) must take exception to it. At the most he (Mr. Leckie) could make it only many pence more. For example, his best samples were worth only about 1s. 6d. per pound more than the other descriptions, although Mr. Bashford's was *par excellence* the silk of Bengal. One of the reasons, he thought, for the smaller importations of 1848 was, that the China silk was more easily worked than most other descriptions, and for that reason was preferred by the manufacturers over the silk of India. With regard to the productions of Broussa, he thought Mr. Bennoch was in error in awarding the meed of praise he had done to the Greeks. He believed only two filatures were owned by the Greeks there, who exported their cocoons to Marseilles and Trieste, which were afterwards very much used in the manufacture of lace at Nottingham. The filatures of which he spoke were termed *Broussa à l'Italienne*, and perhaps few people could tell the difference. The Greeks did not originate the improved system of reeling, but a certain pasha, in 1851. The Greeks, generally speaking, were a people fonder of trafficking than of manufacturing—they liked to "buy and sell and get gain." They were excellent merchants, and we were very much indebted to them. With regard to improving the silk cultivation of India, he believed it to be morally impossible whilst the natives remained so obstinate and so wedded to their old prejudices. They could not get them to reel the silk regularly; sometimes they commenced with from six to twelve or fifteen cocoons going, then a number of ends would become broken—the winding still kept on, and again the broken ends were taken up, and altogether the reel produced was of a most irregular character—a state of things which could not be obviated except by a system of supervision, to which they were at present obstinately averse.

Mr. John Chadwick having been called on by the Chairman, said that he knew nothing of the culture of silk in India, but had listened with interest to the paper which had been read. He said that if the inferiority in the reeling of India could not be overcome, in consequence of the indolence of the natives, there was no reason why the cocoons should not be imported and reeled both in this country and on the continent; for though we cannot give a nerve to the thread which nature has denied it, we can reel an even regular thread instead of an uneven and foul one; but it was, perhaps, of more importance to import the cocoons of China, because they would make a silk equal in fineness, in nerve, and in all other features, to any silk produced. He had himself imported cocoons from China, part of which had been reeled in Manchester and part in France, and in both cases organzine, equal to that of French growth, had been produced. He thought there was no reason whatever why, in the course of time, this country should not reel the silk for its own manufactures, and thus obtain the size of thread best adapted for its requirements. In allusion to a remark made by the Chairman, he said that the policy of free-trade had not yet been applied to the silk manufacture of this country. Sir Robert Peel, in 1846, removed the duty from foreign thrown silk, but retained the highest amount of duty that could practically be enforced on foreign manufactured goods, and this protection (as it was falsely called) was still retained, though the odium now rested with the Government for not removing it, and not with the manufacturers, many of whom had prayed for its removal.

Mr. G. F. Wilson, F.R.S., remarked that Mr. Bennock had drawn attention to the degeneracy of the cultivation of the mulberry leaf. About a year ago, in the Society's Journal, (if he recollected rightly,) there was a notice of some experiments, in which the leaves of the castor-oil plant were substituted for those of the mulberry. He would ask, whether any further reports had been made upon that subject?

The Secretary stated that the experiments with the leaves of the castor-oil plant had not been tried with the ordinary silkworm, but with the *Bombyx cynthia*, a totally different species of worm. More experiments were tried by Col. Sir Wm. Reid, in Malta, and had completely failed.

Mr. Leckie.—It is a worm grown in Assam and the hill country.

Mr. E. C. Tufnell stated that the experiments had completely failed in Malta, in the second crop, but had been attended with some success in Demerara.

Mr. J. Vavasseur said, though Mr. Bashford's experiments to improve the silk-worm of Bengal had failed, his efforts to improve the reeling of their produce had been eminently successful. The superiority of his own and other European filatures over native-reeled silk proved the possibility, by the introduction of European capital and management, of improving the whole of the silk produce of Bengal. The fact that the native growers were able to give from 30 to 40 per cent. for the use of money, proved that there was plenty of scope for profitable investment. It must be borne in mind that the superiority in the European filatures of Bengal was the result of care in the reeling only, not of any improvement in the rearing of the worms. Mr. Bashford said they were half starved, were kept in dark, close, unventilated huts, and that no care was used in selecting the best cocoons for seed. This neglect of all the conditions of the silk worm's health resulted in just what might be expected, a very wretched thread. To produce a good thread for the manufacturer's use, it was indispensable that due care should be taken in respect to—1. The rearing of the worms; 2. The reeling of the cocoons; 3. The throwing. As to this last point, there was not much room for improvement; he (Mr. Vavasseur) would therefore say nothing about that, but in Asiatic silk there was much to be done, both as regarded the rearing the worms and reeling the cocoons. By Mr. Bashford's persevering care in reeling he had improved his silk till it had reached the highest rank among Bengals, but his improvements were brought to a stop, because the cocoon itself was not improved, the natives not taking the necessary care in rearing the silk worm. In China this position was reversed, the worm was very good, and was evidently reared with judgment and attention, so that a superior cocoon was produced, but the best result was not obtained, because the silk was carelessly reeled, for at present Europeans, not being allowed to live in the interior, could not improve the reeling. There was no sufficient motive to induce the natives, in Bengal and China, to improve either the rearing of the worms or the reeling, for all their silk was so eagerly bought at high prices, that it could not be expected that they would put themselves to any trouble to improve an article which in its present condition was so profitable. This state of the market was brought about by the failure of the European crop of 1856, but should the next few years produce the average yield in Europe, the former relative position of Asiatic and European silk would not be maintained, and for this reason,—before the failure of the crop in 1856, Asiatic silk was comparatively little known or used on the continent, but it had now been forced into use there to a great extent. If, therefore, the European crop in future years returned to its annual yield, Asiatic silk would still be favoured with a large consumption on the continent, and as a consequence its average range of price would be higher than before 1856, and European silk would be relatively depressed. If this view were correct, though the present state of the market might be considered exceptional, there was every probability of Asiatic silk commanding better prices than formerly, without any improvement in the article itself. On this, therefore, he (Mr. Vavasseur) based the conclusion that there would be no motive to induce the Chinese or Bengalese to make any alteration in their silk culture. But though the state of the market did not afford a probability of any improvement being made by the natives themselves, it offered additional inducements for European enterprise and capital. What Mr. Bashford had done for his own filature might be done by others, very much to their own profit. The prospects of the silk market offered the highest inducement for European enterprise to commence and to extend the field of silk culture in countries favourable for its growth. They might be broadly described as contained in a zone extending from about 25° to 45° north latitude. Persia, Syria, Asia Minor, Greece, Turkey, and Spain were all favourable for the growth of silk. But it was hopeless to expect the highest results from the growth of silk in eastern countries without European capital and management.

Mr. Lyell said, two years ago he received a letter from Dr. Sutherland, from Port Natal, with a specimen of silk cultivated there, accompanied by a statement that the mulberry tree in that climate was in full leaf nearly all the year round. The country was dry, and in all respects adapted for the successful cultivation of the silkworm. Dr. Sutherland wished him to obtain an opinion as to the fibre of the sample he forwarded. He submitted it to an Italian, who pronounced it to be very excellent.

He thought it a fact worth mentioning, that in that district of the country, there were great facilities for the production of silk of good qualities, and if they were not acquainted with the treatment of silk, cocoons would be imported and made use of in this country.

Mr. J. Chadwick said, he had also received samples of silk from Port Natal, but it was so imperfectly reeled that he could make nothing of it. He had also received samples of silk grown in Australia, but it was merely by way of experiment.

After a few words from Mr. Varley,

The Chairman, in proposing a vote of thanks to Mr. Bashford, took occasion to pass in review some of the extraneous subjects which had been introduced by some of the speakers; but as he had himself set the example by an allusion to the results of the approximation to free trade, since 1846, as far as regarded silk goods, he was hardly in a position to complain of them. Only on one point would it be necessary to explain himself. He (the chairman) in his allusion to the relaxation in 1826, had not, as Mr. Chadwick appeared to think, quoted that year as the introduction of free trade into that particular manufacture, but rather as the dawn of it, for the duty then imposed of thirty per cent. *ad valorem* was anything but the realisation of that policy. It was only an improvement of what had previously obtained, namely, total prohibition.

The following letter has been received by the Secretary since the reading of the paper:—

Sir,—I am of opinion that Mr. Bashford merits thanks from the country, and especially from the silk trade, for his interesting and valuable attempts to improve the silk yieldings of Bengal.

Being much interested in the development of silk reeling in this country, I beg to offer a few remarks upon Mr. Bashford's paper.

I have reeled on my patent machinery Bengal cocoons, and have produced silk therefrom of a quality very superior to that reeled in India. Unfortunately the cocoons are so small that, excepting at a very low cost, a preference would be given for the European by reason of their more abundant yield.

Although Mr. Bashford has not yet realised his expectations, he has evidently made considerable progress, and has demonstrated that the European silkworm will thrive well in India.

I am inclined to suppose that one cause of the degeneration and weakness of the Bengal worm is occasioned by the removal of its species four times yearly. The European silkworm reproduces itself once only in the year, and is evidently much stronger than the Bengal, and yields four times as much silk. I would, therefore, suggest to Mr. Bashford to retard (by artificial means) the incubation of the eggs, so that twelve months shall elapse before they are hatched, and as the mulberry will produce four crops of food, so he might have March silk from the previous March eggs, &c., &c. It appears beneficial for the embryo worm to have twelve months for maturity. Nature will not encourage any violation of her laws. You may improve the black man, but you cannot make him white.

The cold weather crop in Bengal apparently yields the finest silk—this result agrees with the products of Europe. The finer qualities of silk come from the mountainous districts. I concur with Mr. Bashford in his estimation of China cocoons, having reeled therefrom silk superior to any French or Italian. I have for the past three years been prosecuting at my works here practical experiments in silk reeling, and have succeeded in rendering the operation more simple and easy than any process of thread making in other fibrous manufactures.

This new industry will shortly enter upon its development. In due time I expect we shall receive cocoons from the various silk countries, and thus possess, as in the cotton manufacture, our raw material in its primitive form—when our silk manufacturers will not be dependent upon the very imperfectly reeled silk with which they are at present supplied.—I am, &c.,

THOS. DICKINS.

Silk Works, Middleton, Feb. 4, 1857.

The following is the article from the *Daily News* on the Silk Crop referred to by Mr. Bennoch:—

"The failure of the silk crop is not a mere local calamity, nor are its collateral evils confined solely to those engaged in silk manufacture, for it has largely contributed to the monetary derangement from which England and France are but now emerging. It becomes, therefore, a question of general interest to ascertain the true causes of this enormous falling off in production; to inquire whether it may be considered as a merely temporary and accidental calamity, or whether, like the disease in the potato and the vine, its recurrence or continuance is to be apprehended, and if so, what steps should be taken to arrest its progress. The distress it has created in those districts where no inconsiderable proportion of the population derived its chief means of subsistence from the various occupations connected with rearing silkworms and preparing the silk for the market, and the social peril arising from any serious check to the industry of Lyons, have given the subject an importance in France which has already induced those more immediately interested in the question to examine it in all its details. These inquiries are not yet at an end, nor have both sides yet been fully heard. So much progress, however, has been made in the investigation, that we may safely proceed to lay before our readers the following conclusions as those which appear to be most generally accepted in explanation of the deficient yield of silk in France.

"Until the early part of the present century, the rearing of silkworms was carried on by '*magnaniers*,' or silkworm breeders, whose establishments consisted chiefly of themselves and their families, conducting their operations in their ordinary dwelling-houses. The quantity of eggs on which they operated rarely exceeded two or three ounces, and the yield of cocoons was usually about 140 lbs. to the ounce of eggs. The caterpillars were fed on the leaf of mulberry trees, growing almost in a wild state. These trees, preferring a poor calcareous soil, were left nearly in their natural condition, rarely manured, and suffered to grow to their full height, producing a not very abundant crop of leaves of a smaller size and lighter colour than those of the cultivated mulberry, but containing a large amount of nutritive matter. The result of this was a silk of a very superior quality, both for toughness and elasticity, but somewhat high in price. The *magnanier* was rarely the proprietor of the mulberry trees, which were grown as a source of profit by large agricultural proprietors, who sold the leaves to the silkworm feeders. These latter chiefly depended on their own moths for the supply of eggs for the next year's broods, rarely purchasing eggs, unless from neighbouring producers, and selecting, for continuing the race, the largest and finest cocoons; and, when the moths were produced, preserving those only whose strength and physical conformation were such as experience had shown to be the best fitted for ensuring a healthy and hardy race of caterpillars. The first change made in the *system* was on the part of the proprietors of the mulberry trees, who directed their attention to the best mode of increasing the crop of leaves. This was effected by planting the trees in a richer soil, and liberally manuring. The trees, instead of being left to their natural growth, were topped, and a denser mass of foilage was soon produced, the leaves being larger, thicker, and more abundant than before, but containing a much larger proportion of fluid, and having, consequently, a far less concentrated amount of nutriment in a given weight of leaves.

The effect of this apparently improved culture soon declared itself. The silkworms fed on these leaves were less healthy, the crop of cocoons less certain, and the quality of the silk frequently deteriorated. The yield of cocoons fell off from 140 pounds to 100 pounds, then to 80 pounds, and even lower, and finally the small breeders and producers abandoned their occupations, in many instances, as too precarious or unremunerative. The profits of the owners of the mulberry plantations rapidly diminished in consequence, and the system of uniting the occupations of breeder and mulberry grower was adopted, the "*magnaneries*" being at the same time mounted on a much larger scale. Instead of two or three ounces of eggs being operated on, from twenty to fifty was the usual quantity, and the eggs became a regular article of merchandise, the smaller breeders finding it more profitable to wind off all their cocoons than to reserve them as the nucleus of future broods. The ratio of caterpillars to the number of eggs in the meantime steadily diminished, as did also the yield of cocoons, the silkworms having become more liable to epidemic diseases, and less able to resist those atmospheric influences to which they were at all times so susceptible. In the larger establishments these atmospheric variations were sought to be counteracted by artificial heat, which, while it accelerated the changes through which the caterpillars passed, reduced the cost of producing the silk. But it was found that, in spite of improved modes of ventilation and the utmost attention to cleanliness, the liability of the silkworms to disease and the number of eggs which were worthless were on the increase. The yield of cocoons fell from the average of 140 pounds to the ounce of eggs under the old system, to 50, and even 30 pounds; and this year, where it has not utterly failed, it has rarely exceeded 14 pounds. The disease known as the "gattine" has become exceedingly common among the silkworms; the breed is evidently generally enfeebled, and the eggs brought to market are of so doubtful a quality that the small breeders fear to purchase, and are preparing to abandon the rearing of silkworms altogether.

"The evil, therefore, is attributed to the over culture of the mulberry tree, which has increased the quantity of leaves at a sacrifice of quality; and in the absence of proper care in selecting the moths destined to produce the eggs for ensuing operations. It has been found, moreover, that the yield of cocoons diminishes in proportion to the quantity of caterpillars reared in the same establishment, those *magnaneries* operating on from one to ten ounces of eggs yielding a proportionally larger return than those in which from ten to twenty ounces are undertaken. The remedy proposed is, that the present system of over-stimulating the mulberry trees should be abandoned, and that the utmost care should be taken in selecting moths in the most perfect conditions of health and physical conformation, otherwise it is to be feared that, from the constant intermixture of the still vigorous races with those affected by the artificial system of diet and breeding, the silkworm in France will become universally enfeebled, the quality of the silk permanently deteriorated, and its production, as a branch of profitable industry, almost annihilated.

"Unfortunately, however, the growth of the evil has been gradual, extending over the whole of the present century. The value of agricultural property fitted for the present mode of cultivating the mulberry has been fixed on the supposition that it was a permanent branch of industry, and a return to the old system would, it is feared, seriously enhance the price of silk, and therefore diminish its consumption. A very large number of persons are engaged in the various processes of preparing the silk for the market, and it is consequently of the highest importance that the causes which have deteriorated the race of silkworms in France should be thoroughly investigated, and that the remedy should be so applied as to interfere as little as possible with existing interests. The rapid progress which the spread of epidemics among the caterpillars has of late made renders the solution of these questions a matter of urgent necessity; and we earnestly invite the attention of naturalists and commercial men to a subject in which we, as well as the population of the silk districts of Southern Europe, are so largely interested."

Samples of Bengal silk were shown by Henry W. Eaton, Esq., and samples of silk reeled in this country and in France from China cocoons were shown by John Chadwick, Esq.

The Secretary announced that on Wednesday next a paper, by W. Bridges Adams, "On the Application of Railways for Horse Traffic in the Streets and Environs of London," would be read.

AMERICAN PATENT LAW.

The following is extracted from the charge of his Honour Judge Nelson to the Jury, in the case of Sickels v. Borden, lately tried in the Circuit Court of the United States, in the city of New York. The law, as thus laid down by the Judge, is in conformity with the decisions of the Supreme Court, and has very important bearings on the rights of Patentees:—

"The only question remaining for the consideration of the jury, is that of damages. There are two modes of arriving at these in the case of an infringement.

"If the patentee has an established price in the market for a patent-right, or what is called his patent-fee, that sum, with the interest, constitutes the measure of damages. If the patentee has not any established price for a patent-fee, then you are to inquire as to the loss or injury which he has sustained by reason of the infringement, and, as stated by the counsel, the profits which the infringer has made by the use of the invention of the plaintiff, may be taken as the measure of damages. Of course the defendant cannot complain of that, because, if in fact he was an infringer, he has been using the property of the plaintiff, and whatever profits he has made out of it, belong in equity to the owner. It is a question here whether or not there has been an established patent-fee for this improvement proved by the evidence. There is evidence that the patentee sold one of his patent-rights in Philadelphia, for 250 dollars, and that he sold another in Baltimore, for 500 dollars. He sold several rights to the Government, at the rate of 12.50 dollars per cubic foot, which, applied to the Metropolis,* upon the evidence, would amount to 900 dollars. As it respects the 250 dollars and the 500 dollars, you have the explanation of the patentee himself. His object in selling at such prices, he says, was to get the invention into public use, and that he made sacrifices of what he deemed its real value on this account, that the public might see the sucessful working of his improvement. Undoubtedly this circumstance is not peculiar to the plaintiff—this account is perhaps the history of most inventions on their first introduction to public notice and use. It requires effort, influence, and sacrifice on the part of the inventor, to introduce them to the public notice, so that they may acquire the confidence of the community. The public are distrustful of new inventions, and rightfully so: not one out of one hundred issued at the present day is worth, in my judgment, the parchment upon which it is written. It is only now and then a valuable improvement is produced, and it soon becomes the subject of litigation and contest; and even the most meritorious require time, effort, influence, and sacrifice of money, to bring them to the notice of the public. And it is quite proper that these views should be taken into account upon the question of the patent-fee. If the jury are satisfied that it was sold at less than the real value of it, upon the views stated by the patentee, and that sacrifices were made for the sake of introducing it into public use, these considerations should be taken into the account in case of determining the measure of damages by the patent-fee. It is important that the jury should take into account the fact that if they adopt the price of the patent-fee, whatever they may determine that fee to be upon the evidence in the case, it will operate to vest the title of the patent to the extent of its use in the Metropolis throughout its term; and they should state whether they adopt the patent-fee or the profits from the use of the inventions as the measure of damages; for in the former case the title passes, and in the latter case it does not pass, and your verdict will be for a compensation for the use of the invention during the sixty days' use before the suit."

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* The name of the steam vessel on board which the pirated invention was alleged to be used.

The reporter makes the following observation on this part of the charge :—

It will be seen in this case, by studying the law as it is correctly announced by his Honour Judge Nelson, in conformity with the decisions of the Supreme Court, that the "*exclusive right*" of an inventor to make and to *sell* his invention, is held to mean, that any infringer may take it at pleasure, paying for it whatever a jury may say is the price at which the inventor would have sold it to an honest purchaser who recognized his title, and who would pay that price, without the expenses, delay, and vexation of a lawsuit. In this particular case, the verdict of the jury did not work a transfer of the title of Mr. Sickels to the Metropolis, but it was in their power to have done so, as the Court now holds the law, simply by finding a verdict for some price, (say 250 dollars,) and stating that such price was for the patent-fee. If they had found such a verdict, the Court ruled that the title would have passed to the owner of the Metropolis; so that whatever had happened to the *inventor* by the lawsuit, the *infringer* would have got out of any trouble. The "*exclusive right*" to "*vend* to others to be used," an invention, so solemnly "*secured*" by Constitution and by statute to an inventor, therefore means, that a Court and jury may, at *their* discretion, "*vend it to others to be used*," at whatever price they may think fit to fix.

In civilized Europe, the machine which is found to be an infringement of an existing patent, is decreed to be destroyed or confiscated, and the infringer must pay all damage and costs. But here, by the magic of a verdict *against him*, an infringer becomes suddenly transformed from a "pirate" into an honest owner of a patented invention, duly paid for by a few words written in the minutes of some Court, a true copy of which will at any time, when produced, establish his title and prove to the satisfaction of every one but the plundered patentee that the "exclusive right to vend to others to be used," *that* particular invention, is one of the commonest rights in the country, in the "*exclusive*" enjoyment of which any one may share at pleasure. (*Quere.*—Would an infringer be better off by a verdict in his favour?)

Home Correspondence.

TONNAGE AND SHIPPING REGISTRATION AMENDMENT.

Sir,—The cause of "Shipping Registration Amendment," as brought before the Society of Arts by my papers of 16th May, 1845, and 16th January, 1846, having attracted attention and led to many enquiries in further exposition of the views which I individually entertain, and to discussion with reference thereto, I beg the favour of your inserting the enclosed letter which I have addressed to the editor of the *Mechanics' Magazine*, on certain points of discussion which have also been brought forward in the *Journal of the Society of Arts*.

I am, &c.
CHARLES ATHERTON.

Woolwich Dockyard, Feb. 3, 1857.

To the Editor of the Mechanics Magazine.

Sir,—In acknowledgment of your editorial article on "Tonnage and Shipping Registration" in your last number (1747), I am quite satisfied with your new version of the admitted deficiencies of our present system of Shipping Registration as expressed by you in the following terms:—

"What then are the *deficiencies* of the present law on which we are agreed? Of course we acknowledge that the present law does not require the registration of the light or load displacement of a vessel. Does not prescribe a limit of load water line. Does not require the registration of indicated horse-power or any real measure of engine-power equivalent to this. We may further acknowledge, that for scientific purposes, a knowledge of these data may be of the greatest benefit, and we may further admit that it may be worthy of the consideration of a committee appointed by a scientific body of acknowledged authority whether these data can be obtained by legislation or otherwise without any injury to the shipping interest."

I cordially concur in the above your declaration as the editor of the *Mechanics' Magazine*, presuming that by the concluding words, "the shipping interest," you mean the lawful rights of all parties interested in shipping transactions. I observe further, that, notwithstanding your admissions of the deficiencies of our present system of official registration, under the law of 1854, you again advance the often-repeated challenge in support of the sufficiency of the present system, and which I have hitherto declined to notice, because, as I conceive, there ought to be no challenge of intentions. Your often repeated challenge is as follows:—

"The Merchant Shipping Law of 1854 is admirable for the purposes for which it was intended."

Now the foregoing admitted deficiences, as respects the total exclusion of external admeasurements from our present registration establish the following deductions:—

1st. That a vessel of a 100 tons register, and paying fiscal dues as such, may, if it suit the trading interest of parties, be so constructed as to carry 1000 tons weight of cargo. I ask was this anticipated and intended by the framers of the law?

2nd. A merchant may contract with a shipbuilder for a vessel of 1000 tons register, pay the contract price, and find himself the owner of a ship so proportioned and built, with a view to speed and strength, that she will not carry 500 tons weight of cargo within any reasonable limit of load water line; such may be the case; and I ask was this anticipated and intended by the framers of the law?

3rd. As respects the existing reality, every ship, without exception, measured and registered under the law of 1854, of say 100 tons register, is capable of holding 250 tons of goods by measurement, at the usual rate of 40 cubic feet to the ton, and yielding freight on 250 tons though rated for fiscal dues at 100 tons only; hence, with persons who may have occasion to ship goods, and don't know better, fiscal dues to the extent of say five shillings per ton, charged on the ship may be expected to enhance the cost of freight five shillings per ton, and the stipulated rate of freight may be agreed for under this impression, though in reality five shillings per ton on the ship, would be met by two shillings per ton measurement on the cargo. Again, I ask, was this liability to surcharge anticipated and guarded against, or intended, by the framers of the law?—In like manner, and from the same cause, other questionable operations of the law may be cited, all which would be obviated by our shipping registration embracing not only the capacity of ships for holding bulk of cargo, but also their capability for carrying weight of cargo, and a distinctive nomenclature being introduced into our system of registration.

As to the above cited cases, I do not say there would be anything commercially unjustifiable in thus taking advantage of the admitted deficiencies of our registration; and in late numbers of the *Mechanics' Magazine*, the sentiment has been repeatedly advanced as a moral axiom, that one who can be deluded by any uncertainty in the term "Tonnage," deserves no more protection from parliament, than the simpleton in any other trade, who chooses to buy a "pig in a poke." Again I ask was the propagation of such morality as this anticipated and intended by the framers of the law which regulates our shipping registration.

It is evident that advantage may be taken in each of the various cases of tonnage anomaly above specifically cited, and as respects these possible instances of shipcraft, instead of concurring in your declaration, that "the Merchant Shipping Law of 1854, is admirable for the purposes for which it was intended," permit me to say, that the law is lamentably open to being made use of for the purposes above set forth, and that such purposes, if acted upon, constitute public abuses, which have not been anticipated, guarded against, or intended by the framers of the law, and which cannot be permanently upheld.

I remain, &c.,
CHARLES ATHERTON.

Woolwich Dockyard, Feb. 3.

RAILWAY COLLISIONS.

Sir,—As there is so much loss of life, limb, and property by railway collisions, allow me to suggest a telescopic or compressible truck, to be placed before, and another after, each train, the resisting medium being vulcanized India rubber, with ample space to expand externally and internally on being compressed, which would materially ease, if not wholly prevent any serious accident, at a comparatively trifling cost.

I am, &c.,
G. N. SHORE.

Lyme Regis, Dorset, Jan. 30th, 1857.

Proceedings of Institutions.

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Saddleworth.—The twelfth annual meeting of the Mechanics' and Literary Institution took place at Uppermill, 28th ult. Such was the interest of the event, that, several days before the meeting, all the tickets of admission were sold. Amongst those present were J. H. Whitehead, Esq., Southside; Charles J. Buckley, Esq., Holly Ville; Richard Buckley, Esq., Nook; Edward Bottomley, Esq., Greenfield; John Bradbury, Esq., Brownhill; W. K. Schofield, Esq., Heathfields; Samuel Rhodes, Esq., Kirkburton; Ralph Rhodes, Esq., Liverpool; James Platt, Esq., Prospection; Thomas Wood, Esq., Ryefields; William Broadbent, Esq., Harropgreen; James Broadbent, Esq., Carr-house; W. D. Hall, Esq., Diggle Ville; Dr. B. Bradbury, M.D., Dobcross; Robert Hastings, Esq., Dobcross; Dr. Saville, Mossley; Miles Mayall, Esq., Mossley; R. S. Bukley, Esq., Woodend; Ralph T. Bradbury, Esq., Kinders; William Blackburn, Esq., Uppermill; John Shaw, Esq., St. Chads; Thomas Shaw, Esq., St. Chads; Rev. J. Robinson, late of Middlewich; and William H. Robinson, Esq., Marsden. Mr. Lawton, the hon. secretary, read the report, which described the privileges of the institution as consisting of educational classes, circulating and reference library, and reading-room. In the classes are taught—arithmetic, writing, mensuration, grammar, bookkeeping, and geography. The pupils number 59; average attendance, 50. They are in charge of a salaried teacher, who reports them to be diligent in their studies. The library is composed of 1,500 volumes, very few of which have been presented; the average weekly circulation is 82 volumes. The reading-room is well supplied with papers and periodicals of various kinds. The number of members at the end of last December was 153; the average of the year, 152. Of these one pays two guineas annually, 22 one guinea, 15 half a guinea, 103 6s., eight ladies 8s., and three ladies 5s. In addition to these, there are a number of non-paying members, who are sent free by the subscribers of one guinea and upwards, and who enjoy all the privileges of classes, reading-room, and library, the same as other members. About twelve months ago some unknown friend made a donation of £10 to this Institution, on condition that it was spent upon scientific or philosophical instruments, &c. The committee accepted the kind offer, and, in accordance with the wishes of the donor, fitted up and purchased a complete dissolving-view apparatus and microscope, upon the best known plan. The annual income is about £82, including interest from £300, being the balance in hand during the last three years. In concluding this brief report the committee regret that so few, comparatively, of the working-classes take advantage of the privileges of the Institution, which are so numerous and applicable, that whoever is now without a good secular education must in after years, when the want is found, lay the blame upon his own shoulders. The meeting was then addressed by the chairman, Mr. J. B. Robinson, Mr. E. Thornton, Mr. D. Morris, Mr. Frank Curzon (of Huddersfield), Rev. S. Dyson, Mr. James Platt, and other gentlemen.

MEETINGS FOR THE ENSUING WEEK.

Mon. London Inst., 7. Mr. Charles Salaman, "On the History of Music, especially in connection with National Dances."
Architects, 8. I. Mr. C. Fowler, jun., "A Memoir of the late Alexis de Chateauneuf." II. "Some description of the Streets proposed to be formed by the Metropolitan Board of Works." III. "A report to the Council on the Soulages Collection, with reference to recommending its purchase by Her Majesty's Government."
Geographical, 8½. I. Lieut.-General William Monteith, "Notes on the Route from Bushire to Shiraz." II. Col. Sir Henry Rawlinson, "Observations on the Geography of Southern Persia, with reference to the pending Military Operations." III. Lieut.-General Jochmus, "Commentaries on the Battle of Sellasia, &c."
Tues. Royal Inst., 3. Prof. Huxley, "On the Senses."
Syro-Egyptian, 7½. Dr. William Camps, "On the State of Medicine in the Schools of Alexandria and Lesser Asia."
Civil Engineers, 8. Discussion "On the Permanent Way of Railways."
Med. and Chirurg., 8½.
Zoological, 9.
Wed. Literary Fund, 3.
London Institution, 3. Mr. E. W. Brayley, "On Mineralogy and Crystallography."
Society of Arts, 8. Mr. W. Bridges Adams, "On the Application of Railways for Horse Traffic in the Streets and Environs of London.
Graphic, 8.
Microscopical, 8. Anniversary.
Archæological Association, 8½.
Ethnological, 8½.
Thurs. Royal Institution, 3. Prof. Tyndall, "On Sound."
Royal Society Club, 6.
London Institution, 7. Dr. R. E. Grant, "On the Natural History of Extinct Animals."
Antiquaries, 8.
Royal, 8½.
Fri. Astronomical, 3. Anniversary.
Royal Institution, 8½. Mr. T. A. Malone, "On the Application of Light and Electricity to the Production of Engravings—Photogalvanography."
Sat. London Institution, 3. Mr. T. A. Malone, "On Experimental Physics, chiefly in Relation to Chemistry."
Royal Institution, 3. Prof. Phillips, "On the Origin and Progress of Life on the Globe—Fossil Plants."
Medical, 8.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Delivered during the Vacation, 1856.

Par. No.
316. Railways—Returns.
341. East India—Copies of Treaties, &c., with the Native States of India.

393. Gold (Australia)—Return.
395. Army Prize Money—Account.
296. Transportation—Second Report from Committee.
384. Spirits—Return.
388. Dublin Union Workhouses—Returns.
394. Mr. James Sadleir—Copies of the Informations and Warrant.
343. Masters and Operatives (Equitable Councils of Conciliation)—Report from Committee.
387. Churches and Schools—Return.
369. Ecclesiastical Commission—Third Report from Committee, Evidence, &c.
413. Public Health Act—Returns.
349. Grand Jury Presentments (Ireland)—Abstract of Accounts.
397. London Corporation—Annual Accounts.
403. Burmese War—Return.
454. Private Bills—Return of Capital and Loan.
455. Public Bills—Return.
411. Criminous Clerks—Return.
392. Stamped Postage Envelopes, &c.—Returns.
380. Sound Dues—Report and Minutes of Evidence.
390. Churches—Thirty-sixth Annual Report.
416. National Debt—Return.
429. Municipal Boroughs (Ireland)—Abstract of Statement.
252. Finance Accounts—Classes 1 to 8.
311. Court of Chancery (Ireland) Bills—Report from Committee.
383. Compensations (Ireland)—Return.
394. (1). Mr. James Sadleir—Copies of Informations, &c.
428. Oxford University—Copy of an Ordinance.
39. (7.) Trade and Navigation Accounts (31st July, 1856).
422. Army—Index to Report of the Board of General Officers.
431. Customs Duties (Canada and the West Indies)—Correspondence.
432. British Guiana—Correspondence.
337. Civil Service Superannuation—Report from Committee.
345. Transports—Return.
353. Lunatic Asylums—Abstracts of Accounts.
381. Revenue, &c. (Ireland)—Accounts.
396. Sugar, &c —Return.
398. Registers (Scotland)—Return.
399. Church Leaseholds—Return.
400. Rural Police (Scotland)—Return.
402. Grand Jury Cess Applotment (Ireland)—Return.
405. New Palace at Westminster—Correspondence.
401. Valuation (Scotland)—Return.
412. Election Auditors (Ireland)—Return.
420. Poor Laws—Returns.
423. Barrack Masters (Ireland)—Return.
424. Army—Nominal Return of Lieutenant-Colonels.
426. Library of the House—Report from the Committee.
439. Eliza Canningford—Correspondence.
440. Redundant List (Public Departments)—Return.
448. Sittings of the House—Return.
450. Select Committees—Return.
452. Public Bills—Alphabetical List.
453. Private Bills—Returns.
379. Adulteration of Food, &c—Report from the Committee.
110. Justices of the Peace—Return.
378. Standing Orders of the House of Commons.
404. Transportation—Lords' Report.
417. Legacy, &c. Duties—Return.
430. Russian Prizes—Return.
446. Insolvent Debtors' Court—Abstract of Return.
449. Divisions of the House—Return.
456. Criminal Procedure—Report by C. S. Greaves, Esq.
355. Transportation—Third Report from the Select Committee.
389. New Westminster Bridge—Report and Evidence.
375. Public Monies—Report from the Committee.
346. Rating of Mines—Report from the Committee.
421. Army, Commissariat, and Ordnance (1854-55)—Accounts.
332. Local Charges upon Shipping—Report from Committee.
362. Contracts for Public Departments—Report.
376. Friendly Societies—Report of the Registrar.
415. Commissions of Inquiry—Return.
422. (1.) Army (Supplies of the British Army in the Crimea)—Index to Report.
39. (8.) Trade and Navigation Accounts (31st August).
364. Medical Licenses—Returns.
425. Aldershot Camp—Return.
331. Medical Department (Army)—Report.
350. Municipal Boroughs (England and Wales)—Abstract of Return.
410. Bullion, &c.—Account.
418. Malt, &c.—Returns.
419. Navy, Army, &c. (Receipt and Expenditure)—Detailed Account.
445. Baptisms (Church of England)—Abstract of Return.
457. Collectors' Fines (Prescot Division)—Returns.
39. (9.) Trade and Navigation Accounts (30th September).
293. Tithes—Return.
355. (1.) Transportation—Index to Reports.
441. Workmen—Abstract of Return.
380. (1.) Sound Dues—Index to Report.
354. Pilotage—Abstract of Returns.
270. County Treasurers—Abstract of Accounts.
427. Paupers, &c. (Metropolis)—Returns.
444. Wills and Administrations—Abstract of Return.
39. (10.) Trade and Navigation Accounts (31st October).
435. Paupers (Metropolis)—Return.
375. (1.) Public Monies—Index to Reports.
447. Business of the House—Return.
337. (1.) Civil Service Superannuation—An Addition to the Appendix to the Report.
330. Woods, Forests, &c.—34th Report of the Commissioners.
382. Public Income and Expenditure—Account.
414. Superannuations—Return.
442. Burial Fees—Abstract of Returns.
369. (1.) Ecclesiastical Commission, &c.—Index to Reports.
332. (1.) Local Charges upon Shipping—Index to Report.
39. (XI.) Trade and Navigation Accounts (30th November).
438. Children in the Workhouses—Return.
443. Criminal Justice Act—Abstract of Return.
451. Public Petitions—Return.
319. Church Rates (Rates Refused, &c.)—Return.
267. Bill—Aberdeen Colleges.
Railway Accidents (1st January to 30th June, 1856—Returns.
Department of Science and Art—Third Report.
Mining Districts—Report of the Commissioners.
Convict Prisons (Pentonville Prison, &c.)—Reports.
Tariffs (Foreign Countries, &c.)—Return.
Highways (Receipts and Expenditure)—Statements.
Colonial and other Possessions—Statistical Tables, Part I.
Salt in British India—Papers.
Salt in British India—Conclusion of the Commissioners' Report.
Coal Mines—Reports of the Inspectors.
Prisons—Twenty-first Report of Inspectors (Southern and Western District), Part 3.
Trade of Foreign Countries—Abstract of Reports.
Census of Ireland for the Year 1851—Part 5. Tables of Deaths, Vol. 1.
Census of Ireland for the Year 1851—Part 6. General Report
Military Prisons—Report by Colonel Jebb.
Metropolis Water Supply—Reports.
Australia (Discovery of Gold)—Further Papers.
Australian Colonies—Further Papers.
Turnpike Trusts (Scotland)—Abstract of Income and Expenditure.
Trade and Navigation with Foreign Countries (1855)—Annual Statement.
Crown Lands in the Australian Colonies—Further Papers.
Foreign Countries—Statistical Tables, Part 3.
Paris Universal Exhibition—Reports, Parts 2 and 3.
Criminal Offenders (England and Wales)—Tables, 1855.
War with Russia—Addresses, Resolutions, &c., from the British Colonies.
Public General Acts—Cap. 62 to 120, and Table.

Session 1854.

448. (3.) Index to Reports of Commissioners (Cathedral and Collegiate Churches).

Delivered on 4th February, 1857.

323. Church Rates (Monies received and expended)—Return.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, January* 30*th*, 1857.]

***Dated** 26th November*, 1856.

2802. Francis North Clerk, Birmingham—Improvements in metallic roofing for buildings, and in appendages to roofs.

***Dated** 9th December*, 1856.

2916. Thomas Peake, Abbey-street Mill, Derby—Certain improvements in the manufacture of chenille and other piled fabrics.

***Dated** 12th January*, 1857.

98. George Fergusson Wilson, Belmont, Vauxhall—Improvements in treating Burmese and such like petroleum, and their products.
100. Joseph Bennett Howell, Sheffield, and Nicholas Harvey, 12, Haymarket—Improvements in the manufacture of steam boilers.
102. George Eskholme and Henry Wilkes, Rotherham, Yorkshire—Improvements in apparatus for preventing waste of water from service pipes and cisterns.

***Dated** 13th January*, 1857.

104. Alfred Bower, Liverpool—Improvements in or applicable to the keels of navigable vessels.
107. William Gossage, Widnes, Lancashire—Improvements in the manufacture of sulphuric acid, and in the construction of apparatus used for such manufacture.
108. David Cheetham, Rochdale—Improvements in apparatus applicable to steam and other boilers.
109. Michael Potter, Manchester—The application of certain materials in the manufacture of healds for weaving.
110. Robert Cameron Galton, Ham-common—An apparatus for giving alarm to the inmates of dwelling-houses in cases of burglary.
111. François Auguste Verdeil, 30, Rue St. Sulpice, Paris, and Emond Michel, 4, Quai Impérial Puteaux (departement of the Seine), France—Improvements in obtaining extracts from madder for dyeing and printing.
112. John Barsham, Albert-road, Kingston-upon-Thames—An improvement in the manufacture of mats or fabrics used for packing.
113. Robert Russell, Derby—Improvements in stoves and fire-places.

Dated 14*th January*, 1857.

114. Sir James Murray, M.D., Dublin—Abating the smells and increasing the fertilizing usefulness of liquid manures, sewage, gas, or other liquors, and for means of raising or propelling such mixtures and other solids or fluids to convenient heights or distances,
116. John Coope Haddan, 4, Cannon-row, Westminster—Improvements in smelting ores, and in roasting and extracting products therefrom. (A communication.)
117. William Edward Newton, 66, Chancery-lane—An improved steam engine. (A communication.)
118. William Edward Newton, 66, Chancery-lane—An improvement in rollers employed for calendering, mangling, and other processes of analogous character. (A communication.)
119. Gustav Adolph Blittkowski, New-street, U.S.—Improvements in breech-loading fire-arms.

Dated 15*th January*, 1857.

120. Alfred Charles Hobbs, 97, Cheapside—An improvement in locks and latches.
121. David Hamilton Fowler, New Orleans, U.S.—An improvement in steam boilers.
122. George Parker and William Martin, Manchester—Certain improvements in machinery for opening, cleaning, and preparing cotton.
123. Joseph Higham, Manchester—Improvements in valve musical instruments.
124. Charles Wye Williams, Liverpool—Improvements in furnace grates and fire-bars.
125. Thomas Frederick Henley, Bromley—Improvements in the preparation or manufacture of certain beverages or liquors of the nature and character of home-made wines, and in the means of obtaining the same.
126. Francis Watkins, Summerfield-cottage, Birmingham—Improvements in machinery for manufacturing bolts, spikes, and rivets.
127. Alfred Vincent Newton, 66, Chancery-lane—An improvement in steam engines. (A communication.)
128. Julius Homan, Milk-street, Cheapside—Improved machinery for folding cloth into lengths.
129. George Bedson, Manchester—Improvements in coating and insulating wire.
130. Matthew Andrew Muir and James McIlwham, Glasgow—Improvements in moulding or shaping metals.
131. Robert Adamson and Richard Holland, Preston, Lancashire—Certain improvements in looms for weaving.

Dated 16*th January*, 1857.

132. Samuel Haycraft, Birmingham—Improvements in anchors.
133. Thomas Jackson Milnes Townsend, Searby, near Brigg, Lincolnshire—Improvements in drain pipes, and in machinery for producing the same.
134. John Edridge, Birmingham—Improvements in "safety pins" for dress and other similar purposes.
135. Henry Henson Henson, 38, Parliament-street—Improvements in treating animal and vegetable fibre and fabrics for preserving or waterproofing the same.
136. George Storey Moore, Monkwearmouth, Sunderland—An improvement in combining steam engines and boilers, when used with screw or stern propellers of ships or vessels.
137. George Tomlinson Bousfield, Sussex-place, Loughborough-road, Brixton—Improvements in sewing machines. (A communication.)
138. John Henry Johnson, 47, Lincoln's-inn-field—Improvements in cutching machines. (A communication.)

Dated 17*th January*, 1857.

140. Prix Auguste Théodore Pichon, Dijon, France—An improved process for accelerating tanning without the assistance of acids foreign to the bark.
141. Charles Frederic Vasserot, 45, Essex-street, Strand—A new beverage. (A communication.)
142. Charles Frederic Vasserot, 45, Essex-street, Strand—Covering all description of grain with a fertile substance or manure, and the apparatus employed for the same. (A communication.)
143. John Dennison and Henry Hirst, Halifax, Yorkshire—Improvements in looms for weaving.
144. Peter Walker, Warrington—Improvements in apparatus employed in distilling and in the manufacture of vinegar.
145. Augustin Leopold Autran, 39, Rue de l'Echiquier, Paris—Certain improvements in the wicks of candles and lamps.
146. Joseph Cooke and William Cooke, Shrewsbury—A new or improved rotary machine, to be used as a steam-engine, water-wheel, fire-engine, or pump.
147. Andrew Steinmetz, Middle Temple.—The improvement of circular gas burners and their chimnies (to be called the Steinmetz Burner and Steinmetz Chimney).
148. Robert Reeves and John Reeves, Bratton, Westbury, Wilts—Improvements in machinery for delivering manure for agricultural purposes.
149. William Warne, Tottenham—Improvements in the manufacture of deckle straps.
150. John Long, Tiverton, Devon—Improvements in the fastenings of brooches and other articles of jewellery.

Dated 19*th January*, 1857.

151. Nicholas Fortune, Paris—Improvements in the manufacture of knife handles.
152. Henry Vannoy, 25, Rue du Faubourg du Temple, Paris—Certain improvements in heating foot-stoves, beds, and applicable to various other similar purposes.
153. Thomas Sagar and Christopher Turner, Burnley, Lancashire—Certain improvements in power looms for weaving.
155. William Haslett Mitchel, Brooklyn, New York, U.S.—Improvements in means for distributing and composing types.
157. Edwin Clark, 20, Great George-street, Westminster—Improvements in floating docks.
158. John Bird, Chance's Fire Brick Works, near Dudley—Improvements in the manufacture of articles suitable to be used as window heads and sills, lintels, and other similar parts of buildings.
159. Edwin Clark, 24, Great George-street, Westminster—Improvements in machinery or apparatus for raising ships out of the water for the purposes of examination and repair.

Dated 20*th January*, 1857.

161. Thomas Edwards and Daniel Rowley, Brierley-hill, Staffordshire—New or improved machinery for rolling taper bars.
165. Richard Archibald Brooman, 166, Fleet-street—Improvements in the manufacture of petticoats and other knitted fabrics on circular looms or frames. (A communication.)
167. Thomas Johnson, Runcorn, Cheshire—An improvement in purifying alkaline lees.
169. William Henry Barlow, Derby, and Henry Woodhouse, 23 Parliament-street—Improvements in the permanent way of railways.
171. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in apparatus for the preservation of life and property at sea. (A communication.)

INVENTION WITH COMPLETE SPECIFICATION FILED.

180. Thomas Kitelee, Everett-street, Brunswick-square—Am improved combination of ingredients to be employed as a breakfast powder, or article of diet.—21st January, 1857.

WEEKLY LIST OF PATENTS SEALED.

January 30*th*.

1799. Robert William Sievier.
1801. Julien Denis.
1816. Thomas Routledge.
1827. Oliver Long.
1836. George Walker and James Scrimgeour.
1838. Alexander Wright.
1846. Jean Jacques Danduran.
1870. William Gorse.
1876. Thomas Whittaker.
1900. Alfred Priest and William Woolnough.
1970. Etienne Sterlingue.
2012. John Randolph Sees.
2882. Auguste Edouard Loradoux Bellford.
2884. David Crawford.

February 3*rd*.

1834. Nicolas Cadiat.
1844. Antoine Dominique Sisco.
1848. John Keith.
1864. Coleman Defries.
1882. Edward Owen.
1887. Richard Archibald Brooman.
1897. Jean Baptiste Clara.
1925. William Edward Newton.
1927. William Edward Newton.
1939. Joseph Brouard and Joseph Hubert.
1956. Robert Kenton.
2000. Alfred Vincent Newton.
2366. George Hallen Cottam and Richard Cottam.
2389. George William Varnell.
2815. James Higgin.
2897. James Perry.
2905. Richard Eaton.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

January 26*th*.

234. Luther Young and Edwin Marten.

January 27*th*.

201. Patrick Moir Crane.
238. Louis Christian Koeffler.
241. Pierre Joseph Meeus.

January 28*th*.

246. Claude Bernard Adrien Chenot.

January 29*th*.

227. John Kershaw.
240. William Wright and G. Brown.
261. Adolphe Mohler.
264. James Stevens.
273. William Longmaid and John Longmaid.

January 30*th*.

259. Joseph Beattie.
279. James Boydell.
328. Henry Warner, Joseph Haywood, and Wm. Cross.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
3940	Jan. 30.	Life Protector	Isaac Parkes............................	Birmingham.
3941	" "	An Omnibus Lamp......	Price's Patent Candle Company	Belmont, Vauxhall.
3942	Feb. 4.	Fastening for Coffin and other handles	Hector Richard Cooksey	Birmingham.